ABR responses in two species of marine mammals

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Abstract

Plans exist to built numerous offshore windfarms in the North and Baltic Sea, comprising several thousand windmills. The sound emitted during the construction (225+dB re 1µPa) as well as the operation of the windmills is considered to have potentially negative impact on marine mammals. Therefore an audiometric study on harbour porpoises and harbour seals has been initiated within the framework of the research projects MINOS. This study comprises measurements of the absolute hearing threshold of both species in captivity as well as of harbour seals in the wild. These data are prerequisite as a baseline for a subsequent resilience test (TTS test) of the animal's auditory system. The measurement of auditory brainstem response (ABR) is being used in this study. This method is a common tool to investigate the auditory abilities of vertebrates including humans. So far measurements have been conducted on a wild and a captive harbour seal with wideband signals at 4kHz, a male harbour seal with narrow band tone bursts of 0.125 to 16kHz, a male harbour porpoise with tone bursts of 0.3 to 2kHz and amplitude-modulated sounds of 2kHz to 22.4kHz. Thresholds were determined using a correlation technique as well as regression analysis. The resulting audiograms are in accordance with the shape of behavioural audiograms, although thresholds are shifted to higher values. Further animals are currently measured for their absolute hearing threshold and TTS measurements are in preparation. In addition, the responses of seals to broad-band click stimuli was measured comparatively on the captive and on wild animals. ABR waveforms and hearing thresholds were similar to those of the captive individual. It can be concluded that ABR measurements can become a tool for an ecological survey programme with wild-caught animals if more experience is gathered regarding the precise assessment of auditory thresholds under suboptimal conditions.